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Morphology and taxonomic status of *Dasya rigescens* (Rhodophyta, Dasyaceae)

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Abstract – Morphological evidence supports the specific status of the endemic Mediterranean red algal taxon *Dasya rigescens*. Compared to *D. ocellata*, which is a more widely distributed and less deep species, *D. rigescens* shows clear morphological differences in cortication cells, pseudolaterals, spermatangial branches, cystocarps and stichidia location. The nomenclature and lectotypification of *D. rigescens* are discussed, and previous data are reviewed and clarified.

Dasyaceae / *Dasya ocellata* / *Dasya ocellata* f. *rigescens* / *Dasya rigescens* / morphology / nomenclature / Rhodophyceae / taxonomy / typification

Résumé – Morphologie et statut taxinomique de *Dasya rigescens* (Rhodophyta, Dasyaceae). Les caractéristiques morphologiques confirment le statut d'espèce de l'algue rouge de Méditerranée *Dasya rigescens*. Cette dernière est comparée à *D. ocellata*, dont la répartition géographique est plus large et que l'on rencontre à des profondeurs moindres. Une comparaison des deux espèces montre que *D. rigescens* présente des différences morphologiques au niveau de la disposition des stichidies corticales, des rameaux pseudo-latéraux, des branches spermatangiales, des cystocarpes et des stichidia. La définition nomenclaturale et la lectotypification de *D. rigescens* sont discutées. Quelques données précédentes sur cette espèce sont clarifiées.

Dasyaceae / *Dasya ocellata* / *Dasya ocellata* f. *rigescens* / *Dasya rigescens* / morphologie / nomenclature / Rhodophyceae / taxinomie / typification

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INTRODUCTION

Dasya rigescens Zanardini was described from Sebenico (= Šibenik) and Lesina (= Hvar), Dalmatia (= Croatia) (Adriatic Sea) by Zanardini (1865), who related it to *D. ocellata* (Gratel.) Harv., another Mediterranean taxon described from Sète (France) (Grateloup, 1806, as *Ceramium ocellatum*). De Toni (1903) highlighted close similarities of both taxa and suggested treating the former as *Dasya ocellata* f. *rigescens* (Zanardini) De Toni. Nonetheless, Zanardini's taxon is generally accepted as a distinct species by several authors today (cf. Gómez Garreta *et al.*, 2001; Furnari *et al.*, 2003).

Dasya rigescens is a rare species, with only a few records from the central and western coasts of the Mediterranean basin. Consequently, morphological and anatomical data are scarce and incomplete (cf. Zanardini, 1865; Ardissone, 1876, 1883; Hauck, 1885; De Toni, 1903; Preda, 1908).

In the present study new morphological evidence is presented to support the specific status of *D. rigescens*.

MATERIAL AND METHODS

Field observations and sampling were carried out by M.V. between February 1978 and March 2002 in several north-western Mediterranean localities. Although during 2006-2009 several field explorations were carried out in different sites where individuals of *D. rigescens* had previously been collected, no additional samples were obtained. Samples were preserved in buffered 4% formaldehyde-seawater or dried specimens marked "H + number" have been deposited in HCOM, Centre d'Océanologie de Marseille, France. Herbarium specimens were rehydrated in distilled water, manually sectioned with a razor blade, stained in 1% aqueous Aniline Blue, washed, and then acidified by addition of a drop of 1 N HCl. Photomicrographs and measurements were made using a Nikon Optiphot-2 (Nikon, Japan).

Studied material

Herbarium HCOM, Marseille, France, Herbarium Verlaque: *Dasya rigescens* Zanardini. Specimen H2463, Corsica, Lavezzi Archipelago, Punta Rossa (41° 20' N, 9° 15' E), 28 November 1989, 37 m depth, Coralligenous assemblages, male gametophyte. Specimen H2530, Corsica, Lavezzi Archipelago (41° 20' N, 9° 15' E), June 1991; Specimen H4124, France, Gulf of Fos, Ponteau (43° 21' N, 5° 00' E), 19 February 1978, 15 m depth, Coralligenous assemblages, tetrasporophyte. Specimen H4125, Balearic Islands, Majorca, Soller (39° 48' N, 2° 41' E), 6 May 1989, 10 m depth, sciaphilous assemblages, female gametophyte (as *D. rigescens*?). Specimen H7298, France, Marseille, Samena cove (43° 13' N, 5° 20' E), 31 March 2002, 17 m depth, dead *Posidonia oceanica* (L.) Delile, meadows, tetrasporophyte.

Other material of *Dasya rigescens* Zanardini examined

Other herbarium specimens were studied without rehydration, from the following herbaria: Herbarium HCOM, Marseille, France, Herbarium P. & H. Huvé : Specimen H601, France, Banyuls-sur-Mer (42° 29' N, 3° 08' E), August 1961, 36-40 m depth, sterile, (as *D. ocellata*).

Herbarium MCVE, Museo Civico di Storia Naturale di Venezia, Italy, Herbarium Zanardini: Specimen unnumbered, Croatia, Lesina (=Hvar) (43° 05' N, 16° 35' E), without date, tetrasporophyte and sterile.

Herbarium Rodríguez-Femenias, Ateneu Científic, Literari i Artístic, Maó, Minorca, Balearic Islands, Spain: Specimen 2314, Spain, Balearic Islands, Menorca, Cap d'En Font (38° 49' N, 4° 12' E), 11 October 1887, 95 m depth, sterile (as *D. ocellata*). Specimen 2320, *ibidem*, 24 September 1897, 75 m depth, sterile (as *D. pedicellata*). Specimen 2324, Spain, Balearic Islands, Menorca, Canutells (39° 50' N, 4° 10' E), 13 October 1895, 55-70 m depth, sterile [as *D. pedicellata* (C. Agardh) C. Agardh].

Herbarium PC, Muséum National d'Histoire Naturelle, Paris, France, Herbarium J. Feldmann: Specimen 11162, France, Villefranche-sur-Mer, 7 May 1966, dredging, sterile. Specimen 10442bis, France, Banyuls-sur-Mer, Cap Béar (42° 31' N, 3° 09' E), 12 May 1960, dredging, sterile [as '*Dasyopsis'*]. Specimen 10758, *ibidem*, 28 May 1962, dredging, tetrasporophyte [as '*Dasyopsis rigescens* (Zan.)']. Specimen 2257, *ibidem*, 22 June 1932, 20-25 m depth, sterile (as *Dasya ocellata*). Specimen 2743, France, Banyuls-sur-Mer, Cap Bear (42° 31' N, 3° 09' E), 5 December 1932, 33 m depth, sterile (as *Dasya ocellata*). Specimen 5449, France, Banyuls-sur-Mer, Cap l'Abeille (42° 28' N, 3° 09' E), 5 July 1939, dredging 25 m, female gametophyte (as *Dasya ocellata*). Specimen 1781, *ibidem*, 24 August 1931, dredging 25-30 m, sterile (as *Dasya ocellata*). Specimen 2014, France, Banyuls-sur-Mer, Cap du Troc (42° 29' N, 3° 09' E), 26 January 1932, 12-15 m depth, tetrasporophyte (as *Dasya ocellata*).

Herbarium PC, General Herbarium: Specimen AR 16714, Corsica, Calvi (42° 34' N, 8° 45' E), undated, tetrasporophyte (as '*Dasya spinella* Ag.').

Other liquid preserved materials:

Herbarium HGI-A, Universitat de Girona, Spain: Specimen HGI-A 7373, Illes Formigues, Palamós, Girona (41° 51' N, 3° 10' E), 30 October 2006, 40 m depth, sterile (as *Dasya baillouviana*). Specimen HGI-A 4268, Aiguafreda, Begur, Girona (41° 57' N, 3° 13' E), 29 July 1997, 10-20 m depth, sterile (as *Dasya baillouviana*). Specimen HGI-A 8890, Mitjorn, Maó, Minorca (39° 51' N, 4° 17' E), 23 June 2007, 59 m depth, sterile, (as *Dasya baillouviana*). Specimen HGI-A 9073, Mitjorn, Maó, Minorca (39° 51' N, 4° 17' E), 15 June 2008, 58 m depth, sterile (as *Dasya baillouviana*).

Herbarium acronyms follow Thiers (2010).

RESULTS

Literature data

In the protologue, Zanardini (1865) described *Dasya rigescens* as an erect alga, up to 2-3 inches (≈ 5-7.5 cm) tall, with a thick basal disc, and axes irregularly branched with alternate, unilateral or opposite branches. Branches naked up to the half, are covered upwards with monosiphonous pseudolaterals, which are nearly 2 lines long (≈ 4 mm), dichotomous, patent, rigid and markedly tapering towards the apex, with cells 10 or more times longer than broad. These pseudolaterals arise from the cortex, and show a multicellular base. Stichidia also arise from cortex, on a brief pedicel; they are linear and bear a long monosiphonous sterile apical filament, which is composed of cells 2-3 times longer

than broad. Tetrasporangia are arranged in a double series. Substance is fleshy and stout, with a beautiful red-crimson colour (coccineus).

Zanardini considered his new taxon very close to *D. ocellata,* from which it differs mainly in the polysiphonous base of the monosiphonous pseudolaterals, and the stichidia directly inserted on the axes and with a long apical sterile filament. In addition, he mentioned that the cortical cells were thinner and more closely disposed than in *D. ocellata*.

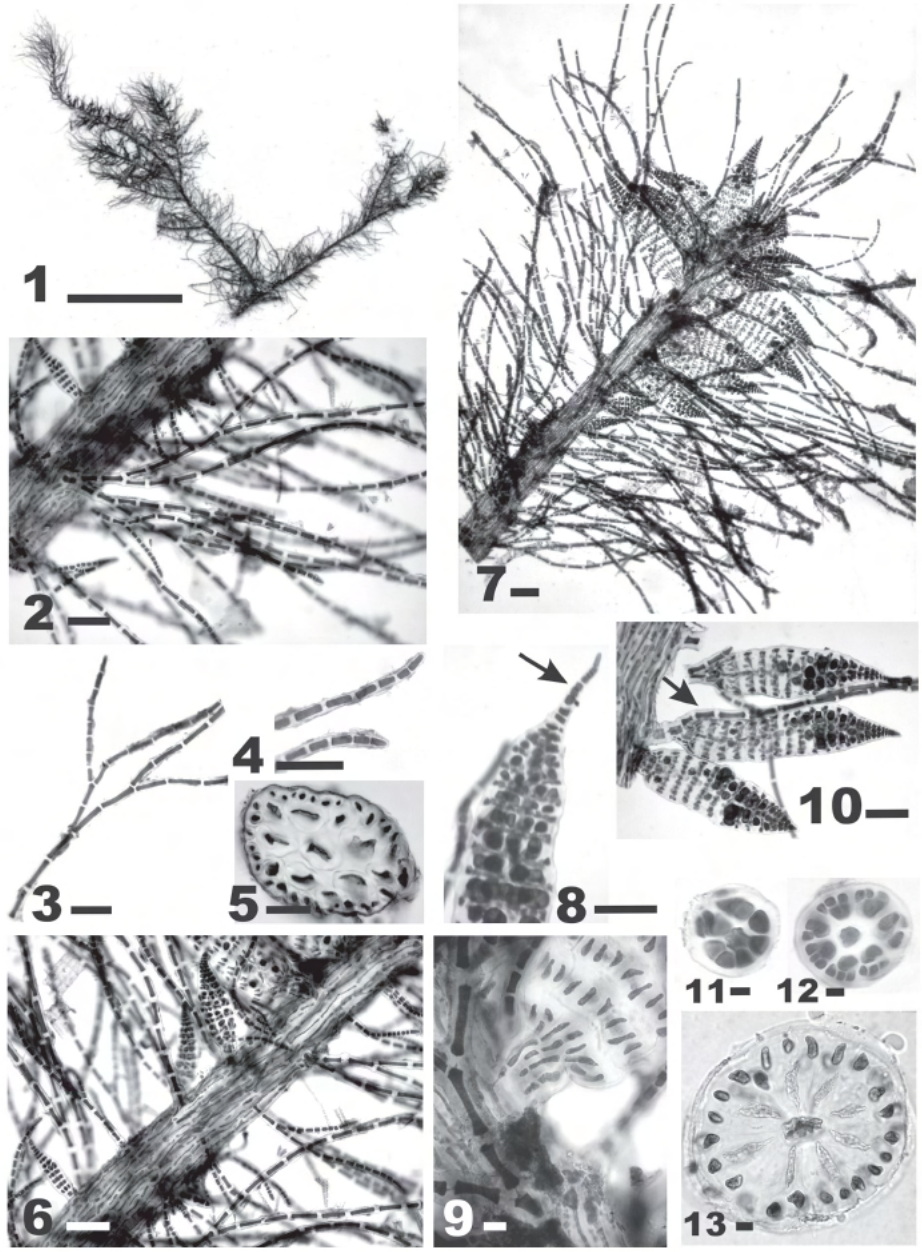
Besides the original protologue, Ardissone (1876) was the only author to report additional morphological information of *D. rigescens*. He described plants of 4-6 cm high, with terete axes *ca* 0.5 mm wide near the base, and irregularly branched, with a very opened branching; branches smooth below, penicillate-villose above; monosiphonous pseudolaterals arising in all directions, monosiphonous from the origin or as well with a polysiphonous and corticate base similar to a branch ("*...ma ora sono monosifoni sino dalla loro origine, ora invece provengono da una base polisifonia corticata simile ad una ramificazione del caule"*), with a very long final segment and cells mostly 2-4 times longer than broad, though some of them are shorter and in an intercalary position; dried specimens deep purple; consistence rigid below and more flaccid towards the apex. Ardissone also considered that this taxon was very similar to *D. ocellata*, from which he only differentiated by its greater size and its more abundant branching. He did not see reproductive structures.

Mazza (1924) also provided a brief description of this taxon, but did not provide new morphological data.

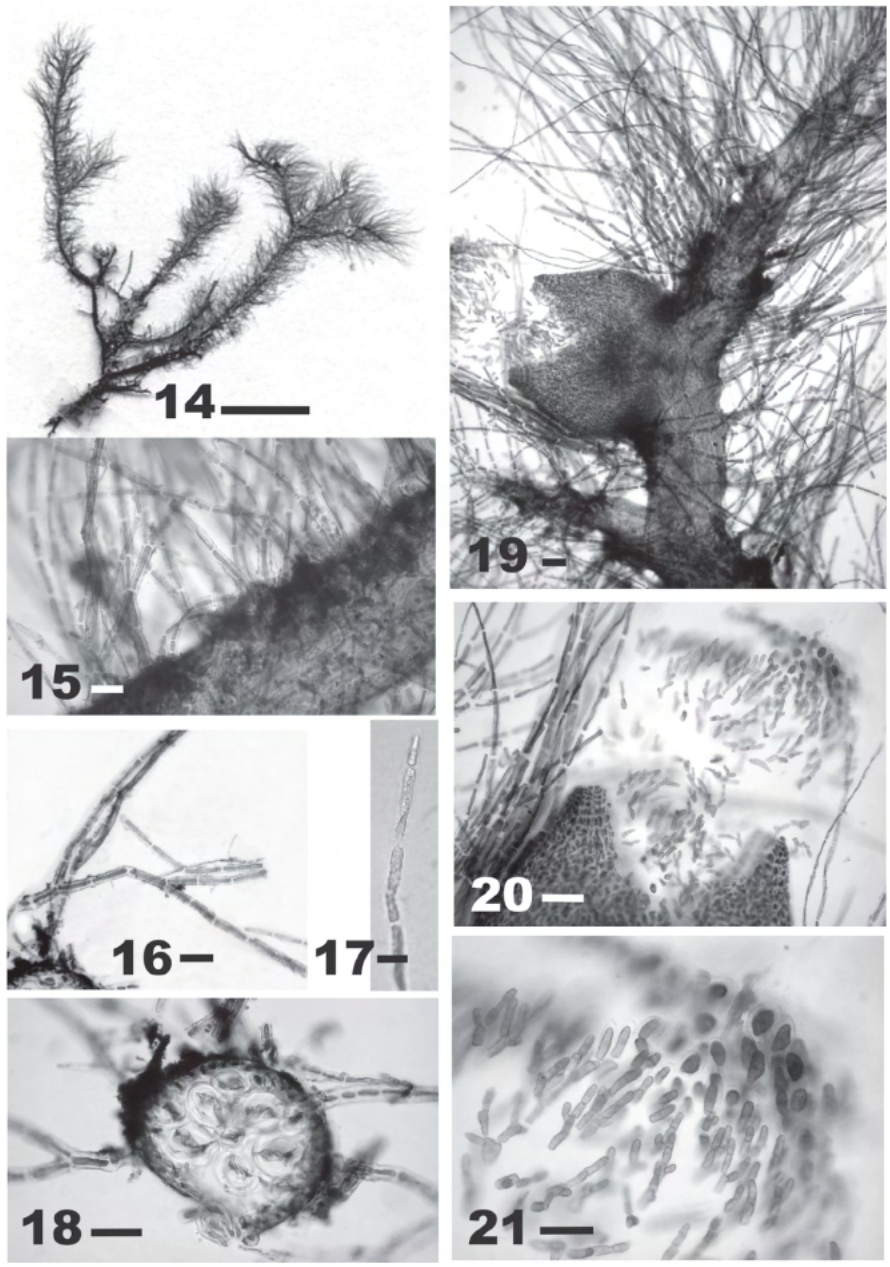
Morphology, ecology and distribution

Our plants are dark to blackish red in colour, up to 5 cm high (Figs 1, 14, 22). The terete axes, up to 1 mm in diameter, arise from a rhizoidal system, composed by corticated polysiphonous branches bearing monosiphonous rhizoidal filaments (Fig. 34). The axes are heavily corticated and sparsely and alternately branched. The dense cortication begins close to the apices. Axes are polysiphonous, with 5 periaxial cells per segment (Figs 5, 18, 26). At the lower part of axes, the number of periaxial cells is more or less obscured by the insertion of large inner cortical cells but internal rhizoids are lacking (Figs 30-33). Cortical cells, 25-100 µm long and 6-10 µm wide, are far one another 0-5(-10) µm. Axes are densely clothed with pigmented monosiphonous pseudolaterals and adventitious monosiphonous filaments inserted at 80-90°. Pseudolaterals pseudodichotomously branched, 1.0-2.5 mm, 30-50 µm wide at the base, and up to 10-13 µm at the apex, are spirally arranged, one per segment, with cells 1.5-4(-10) times as long as broad (Figs 2-4, 15-17 and 23-25). Branchlets of pseudolaterals with 18-25 cells. The basal cell of pseudolaterals is not corticated but sometimes the cortical cells of axes slightly cover it. There are three or four successive subdichotomies with the first dichotomy on the suprabasal cell and a successive branching sequence of: 2-3; 2-4; 2-5; 3-5 cells (it means that there are 2 or 3 cells before the second dichotomy, 2-4 before the third, and so on). Adventitious filaments, numerous, simple or once subdichotomously divided far on the base, 1.0-1.6 mm and 14-22 cells long, are produced by cortical cells (Figs 2, 15 and 23).

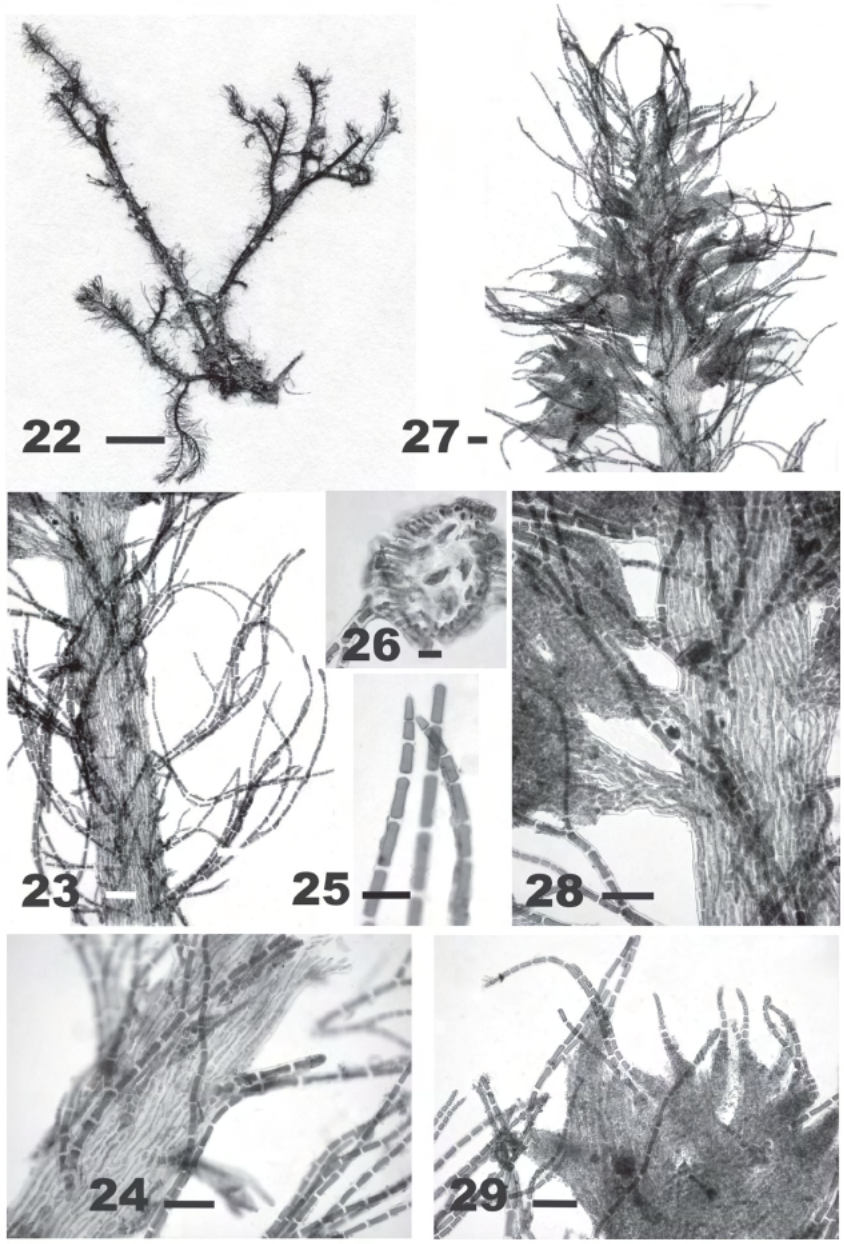
Tetrasporangial stichidia, which are up to 500-580 µm long by 130-140 µm broad and contain up to 20-22 fertile segments, develop directly on the axes (Figs 6-7 and 9-10). They are cylindrical-conical with a sterile apex, which sometimes grows up a short sterile monosiphonous filament up to 12 cells long



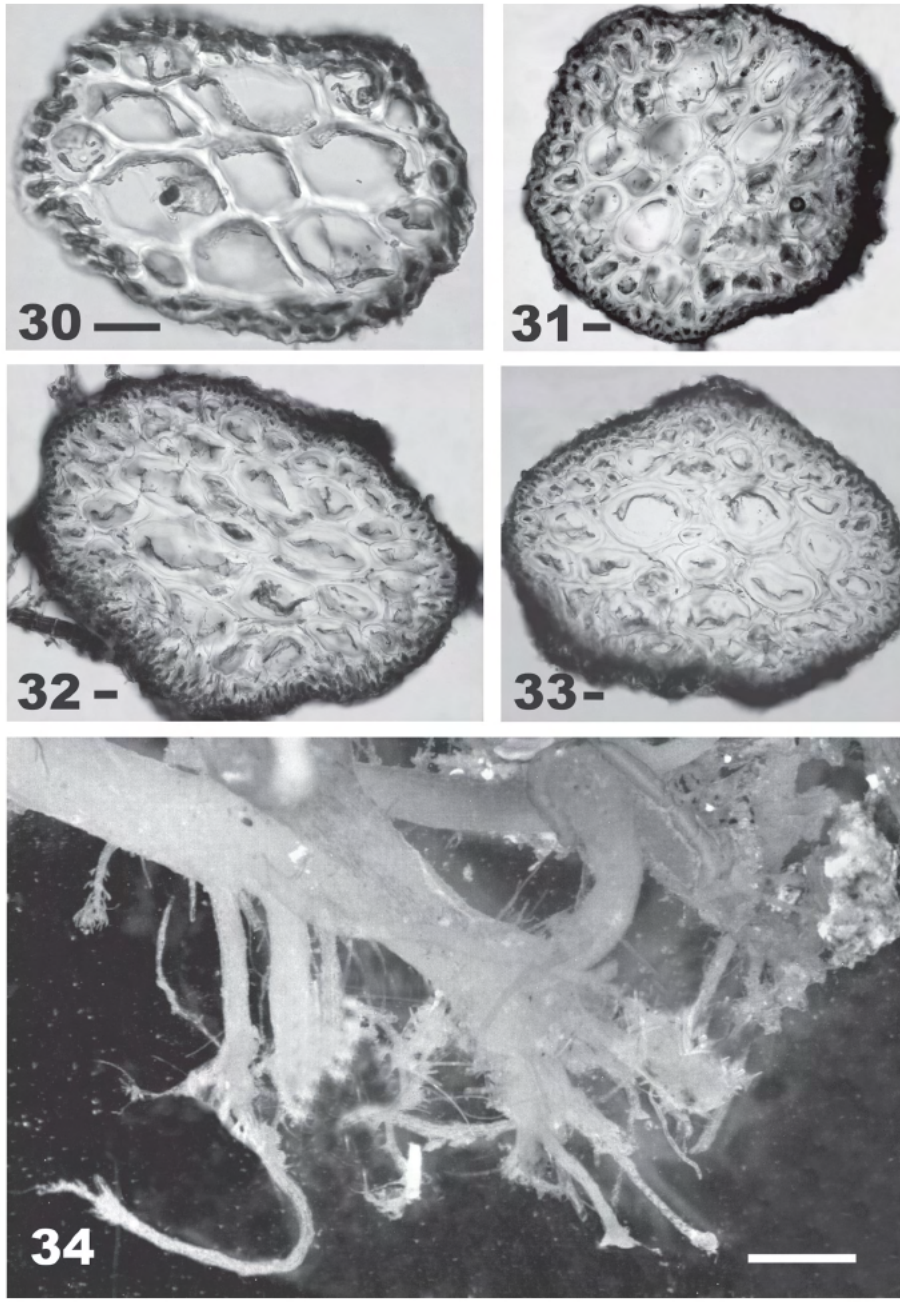
Figs 1-13. *Dasya rigescens* Zanardini, Herbarium specimen H7298, Marseille, tetrasporophyte. **1.** Habit. Scale bar = 5 mm. **2.** Axis bearing pseudolaterals and adventitious monosiphonous filaments. Scale bar = 100 µm. **3.** Lower portion of pseudolateral. Scale bar = 100 µm. **4.** Terminal cells of pseudolateral. Scale bar = 100 µm. **5.** Transverse section of the upper part of the axis. Scale bar = 50 µm. **6.** Axis bearing young stichidia. Scale bar = 100 µm. **7.** Axis bearing mature stichidia. Scale bar = 100 µm. **8.** Stichidium with short sterile apical filament (arrow). Scale bar = 100 µm. **9.** Corticated stalk of stichidium. Scale bar = 20 µm. **10.** Stichidium with monosiphonous filament on stalk (arrow). Scale bar = 100 µm. **11-13.** Transverse sections of a stichidium. Scale bar = 10 µm.



Figs 14-21. *Dasya rigescens* Zanardini, Herbarium specimen H4125, Majorca, Balearic Islands, female gametophyte. **14.** Habit. Scale bar = 5 mm. **15.** Axis bearing pseudolaterals and adventitious monosiphonous filaments. Scale bar = 100 µm. **16.** Lower portion of pseudolateral. Scale bar = 100 µm. **17.** Terminal cells of pseudolateral. Scale bar = 20 µm. **18.** Transverse section of the upper part of the axis. Scale bar = 100 µm. **19.** Axis bearing a cystocarp. Scale bar = 100 µm. **20.** Ostiole broken and gonimoblast filaments with terminal carposporangia. Scale bar = 100 µm. **21.** Detail of gonimoblast filaments with terminal carposporangia. Scale bar = 50 µm.



Figs 22-29. *Dasya rigescens* Zanardini, Herbarium specimen H2463, Lavezzi Archipelago, Corsica, male gametophyte. **22.** Habit. Scale bar = 5 mm. **23.** Axis bearing pseudolaterals and adventitious monosiphonous filaments. Scale bar = 100 µm. **24.** Lower portion of pseudolateral. Scale bar = 100 µm. **25.** Terminal cells of pseudolateral. Scale bar = 50 µm. **26.** Transverse section of the upper part of the axis. Scale bar = 50 µm. **27.** Axis bearing spermatangial branches. Scale bar = 100 µm. **28.** Detail of spermatangial branches showing the corticated stalk. Scale bar = 100 µm. **29.** Upper portion of spermatangial branches showing terminal monosiphonous filaments. Scale bar = 100 µm.



Figs 30-34. *Dasya rigescens* Zanardini, transverse sections of the lower part of the axis. **30.** Herbarium specimen H7298, Marseille, tetrasporophyte. Scale bar = 50 µm. **31.** Herbarium specimen H4125, Majorca, Balearic Islands, female gametophyte. Scale bar = 50 µm. **32-33.** Herbarium specimen H2463, Lavezzi Archipelago, Corsica, male gametophyte. Scale bar = 50 µm. **34.** *Dasya rigescens* Zanardini, specimen HGI-A 7373, Illes Formigues, Girona, sterile, detail of the rhizoidal base. Scale bar = 1 mm.

(Fig. 8). The pedicel is monosiphonous, with 1-2 cells, and usually heavily corticated (Fig. 9). Rare stichidia can bear a lateral monosiphonous filament on the pedicel (Fig. 10). Each fertile whorl has 6-7 (8) periaxial cells that produce a total of 19-23 cover cells (2-3 per periaxial cell). In surface view, the cover cells are palisade-like, 8-14 × 8-12 μm, and scarcely mask the sporangium (up to 1/4). Six or seven tetrasporangia, each up to 20-35 μm in diameter, are formed per fertile whorl (Figs 11-13).

Gametophytes are dioecious. Our description and illustrations of reproductive organs must be considered with caution because they are based on only one fertile specimen of each sex. Cystocarps are sessile, lateral, on the upper portion of axes. Pericarp, up to 545 μm in diameter, is slightly urceolate (Fig. 19), with a carpostome up to 100 μm high, slightly prominent. Pericarp cells show variable shapes and sizes, but they are generally elongated, 12-40 × 6-12 μm, and slightly reducing in size towards the carpostome edge. Gonimoblast is much branched with apical and lateral carposporangia, ovoid to clavate, 35-41 × 21-28 μm, not arranged in series (Figs 20-21).

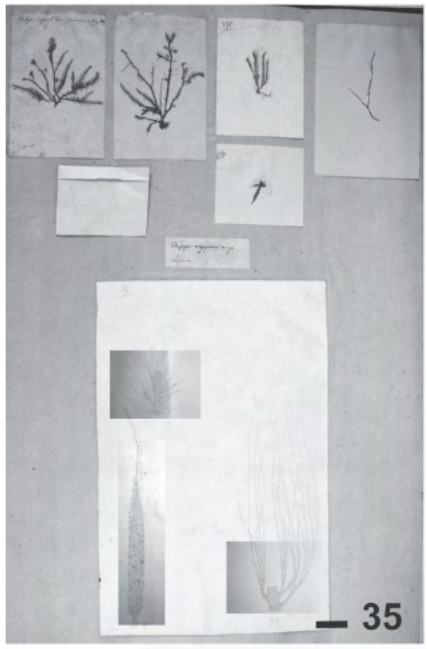
Spermatangial branches are cylindrical, 250-350 μm × 70-90 μm, 1-3 times dichotomously branched, developing directly on the axes and ending by sterile monosiphonous apical filaments, 150-450 μm and 6-14 cells long (Figs 27-29). Pedicels are monosiphonous, 1-3-cells long, and heavily corticated. Spermatangia, 8-10 × 2-4 μm, are slightly elongated.

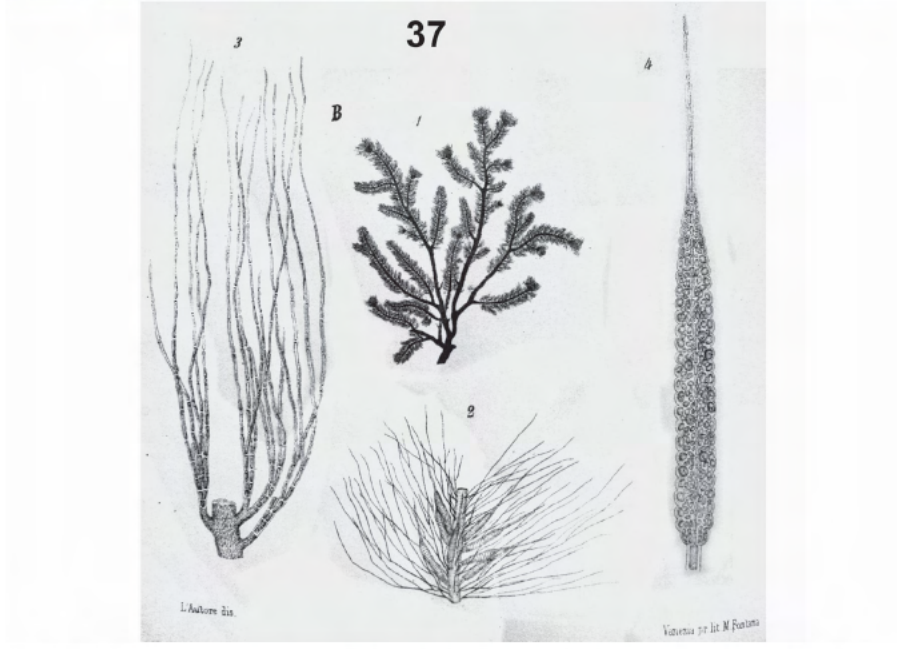
Dasya rigescens is a rare endemic Mediterranean taxon. It is reported from 10 to 95 m deep, in sciaphilous rocky substrate assemblages, coralligenous and dead *Posidonia oceanica* meadows. Mediterranean distribution is not yet well-known. Based on the current distributions records, the species is restricted to the Adriatic Sea (Zanardini, 1865; Gómez Garreta *et al.*, 2001; Furnari *et al.*, 2003) and the western Mediterranean basin: the Balearic Islands, Spain (present study), Corsica, France (present study), Marseille, France (Gómez Garreta *et al.*, 2001; present study), Naples, Italy (Ardissone, 1883). Since several specimens of this taxon have previously been misidentified as *D. ocellata*, the revision of herbarium vouchers labelled as *D. ocellata* (mainly those collected in the western Mediterranean Sea and near waters) is strongly recommended.

The phenology of the species is poorly understood. Based on our data, the species seems to be perennial. Specimens were collected in winter (January-March), spring (May), summer (July) and autumn (November). Tetrasporangia were present in cold season (January-March and May), cystocarps in May and July, and spermatangia in November.

Nomenclature

Zanardini (1865) described *Dasya rigescens*, in his "Scelta di ficee nuove o più rare dei mari mediterraneo ed adriatico". The epithet "*rigescens*" refers to its "rather rigid" habit. In the protologue, both the above reported description and a plate marked "pl. XLII B" ["pl. XV B" in *Mem. Reale Ist. Veneto Sci. Lett. Arti* 12(2)] are given. The author cites two localities where the species was collected: Sebenico (Dalmazia), collector Vidovich; and Lesina (Dalmazia), collector Botteri, but he didn't indicate the Holotype. Nowadays, only material from Lesina is conserved in Herbarium Zanardini, at MCVE (Venice, Italia), and it consists of a sheet with five specimens, and 3 original drawings corresponding to figures 2, 3 and 4 of the plate XV B of the protologue (Figs 35, 37). Undoubtedly, the figure 1 of that plate was drawn from a specimen of the MCVE





Figs 35-37. *Dasya rigescens* Zanardini - Herbarium Zanardini conserved at the Herbarium MCVE (Museo Civico di Storia Naturale di Venezia). **35.** Voucher specimens and original drawings of *Dasya rigescens,* Croatia, Lesina (=Hvar) (43° 05' N, 16° 35' E). Scale bar = 2 cm. **36.** Specimen B here selected as lectotype (arrow: rhizoidal base). Scale bar = 5 mm. **37.** Plate XV B of *D. rigescens* [from Zanardini, 1865. *Mem. Reale Ist. Veneto Sci. Lett. Arti* 12(2)].

sheet, concretely the second on the left side labelled as "B" (agreeing with the"B" of the name of plate: "pl. XV **B**") (Figs 36-37) and used by Zanardini to illustrate his species. Therefore, being a syntype, it is here chosen as the lectotype of *Dasya rigescens*.

DISCUSSION

While Zanardini (1865) suggested a close affinity between *D. rigescens* and *D. ocellata*, he regarded them as distinct species on the basis of clear differences in the position of stichidia on the polysiphonous axes, narrower and closer cortical cells and the long apical filament at the apex of stichidia. The last character was not observed in our specimens, where those filaments are short or absent (Figs 7-10). He also mentions the polysiphonous base in pseudolaterals as distinctive character, which on the basis of our observations should be considered as a misinterpretation by Zanardini of the cortication that sometimes covers this region. Ardissone (1876) repeats the same misinterpretation, possibly because he mostly transcribes Zanardini's description but he adds that the pseudolaterals can be also monosiphonous from the origin (see above). Zanaridini's plate XLII B (Fig. 37) illustrates a stichidium with a not corticated base, while our material shows corticated bases (Fig. 6, 7, 9) with rare exceptions (Fig. 10). Finally, it is remarkable that Zanardini describes cells of pseudolaterals up to 10 times as long as broad, whilst Ardissone (1876) affirms that they are 2-4 times as long as broad, with interposed shorter cells. However, according to our observations, none of these affirmations is fully correct, since these cells have a very variable length, mainly depending on their location. Generally, cells are as long as broad at base, they progressively increase in length towards the apex, until reaching a length of 8-10 times the diameter at the middle part of pseudolaterals, before decreasing towards the apex where the last cell is as long as broad.

The present morphological and anatomical data support the recognition of a distinct species, *D. rigescens*. At least 9 characters (see Table 1) allow a clear distinction between *D. rigescens* and its morphologically closest relative, *D. ocellata*.

The size and position of the cortical cells are clearly different. *D. ocellata* has cortical cells 10-90 µm long and 8-20 µm wide that are laxly arranged (distance between cells 5-10 µm), while in *D. rigescens* they are more elongated, 25-100 µm long and 6-10 µm wide, and more compactly arranged (distance between cells 0-5 µm). Although colour is a rather variable character, *D. rigescens* shows a very dark red colour, almost blackish, while *D. ocellata* shows a more or less dark red colour, but never blackish. A distinctive character, evident with the naked eye, is the patent disposition of pseudolaterals and adventitious filaments on the polysiphonous axes, with an angle of 80-90° in *D. rigescens* versus 40-60° in *D. ocellata*. The longest pseudolaterals in *D. rigescens* are longer (up to 2.5 mm) than in *D. ocellata* (up to 1.8 mm) and the maximum length of the ultimate branchlets of pseudolaterals is also higher (0.8-1.5 mm in *D. rigescens* versus 0.6-1.0 mm in *D. ocellata*). The maximum number of cells of those ultimate branchlets is also higher in *D. rigescens* (18-25) than in *D. ocellata* (10-17). *D. rigescens* has numerous monosiphonous adventitious filaments, simple or once subdichotomously divided, and slightly shorter than pseudolaterals. This feature, very distinctive of the latter taxon, is not present in *D. ocellata*. As far as the reproductive organs are concerned, stichidia of *D. rigescens* have 6-7 tetrasporangia per fertile whorl,

Table 1. Comparison of morphological features between *Dasya ocellata* and *D. rigescens*. The most significant characters are indicated in bold.

	Dasya ocellata (Gratel.) Harv.	***Dasya rigescens*** Zanardini
PLANTS, height (cm)	Up to 3	Up to 5
AXES, diameter (μm)	Up to 600	Up to 1000
CORTICAL CELLS, height × width (μm)	10-90 × 8-20	25-100 × 6-10
Distance between contiguous cells (μm)	**5-10 (rarely 0-5)**	**0-5 (rarely 5-10)**
PSEUDOLATERALS, angle with axes	**40-60º**	**80-90º**
Length (mm)	**1.0-1.8**	**1.0-2.5**
Ultimate branchlets, length (mm)	0.6-1.0	0.8-1.5
Number of cells	**10-17**	**18-25**
Base, width (μm)	40-70	30-50
ADVENTITIOUS BRANCHES	**Rarely present and equal to pseudolaterals**	**Monosiphonous, simple or once subdichotomously divided**
TETRASPORANGIAL STICHIDIA	**On 2nd or 3rd dichotomy of pseudolaterals**	**Directly on axes**
Pedicel, number of cells	(1) 2-3 (4)	1-2
Apex, number of sterile cells	**3-4 (rarely up to 12)**	**6-12**
Periaxial cells, number / fertile whorl	**5**	**6-7 (8)**
Tetrasporangia, number / fertile whorl	**5**	**6-7**
Tetrasporangia, diameter (μm)	30-50	20-35
Cover cells, number / fertile whorl	**11-14 (19)**	**19-23**
Cover cells, height × width (μm)	20-30 × 10-18	8-14 × 8-12
CYSTOCARPS	**Apical**	**Lateral and sessile**
Carpostome, height (μm)	**100-300**	**100**
Carpospores, length × width (μm)	40-50 × 20-30	35-40 × 21-28
SPERMATANGIAL BRANCHES	**On 2nd or 3rd dichotomy of the pseudolaterals**	**Directly on axes**
Length × width (μm)	400-500 × 60-100	250-350 × 70-90
Apex, number of sterile cells	**3-6**	**6-14**
Spermatangia, length × width (μm)	5-6 × 2-3	8-10 × 2-4
DEPTH RANGE	**0-8 m**	**10-95 m**
DISTRIBUTION	Mediterranean, European Atlantic, North of Africa, Atlantic Islands and Indian Ocean	Adriatic and Western Mediterranean

while in *D. ocellata* they have 5. Spermatangial branches (and often tetrasporangial stichidia) have a terminal filament in *D. rigescens*, which are not present in *D. ocellata*. Tetrasporangial stichidia and spermatangial branches position is also a distinctive character, since in *D. ocellata* they arise from the 2^{nd}-3^{rd} dichotomy of the pseudolaterals, and in *D. rigescens* directly on the polysiphonous axes, borne by a pedicel usually corticated.

Although *D. ocellata a*nd *D. rigescens* are both sciaphilous, they grow at very different depth ranges, namely 0-8 m deep for *D. ocellata* and 10-95 m deep for *D. rigescens*. Both species also seem to have a different geographical distribution. *D. ocellata* is more widely distributed and abundant than *D. rigescens*, though less than some others species of the genus that are considered cosmopolitan (e.g. *D. hutchinsiae* W.H. Harvey) (cf. Guiry & Guiry, 2010).

In conclusion, this study confirms the morphological distinctiveness of *D. rigescens*, justifying its recognition at the species level. DNA sequence data will be needed to confirm our morphological data as intraspecific morphological variation and plasticity have been shown to be common in seaweeds (e.g. Zuccarello *et al.*, 2006; Leliaert *et al.*, 2009).

In accordance with article 9.9 of the International Code of Botanical Nomenclature (McNeill *et al.*, 2006), we designate a lectotype as reported below.

Dasya rigescens Zanardini, *Mem. Reale Ist. Veneto Sci. Lett. Arti* 12(2): 385-386, pl. XV B. 1865 [*Iconogr. Phycol. Adriat.* 2(1): 7-8, pl. XLII B. 1865].
≡ *D. ocellata* (Gratel.) Harv. f. *rigescens* (Zanardini) De Toni, *Sill. Alg.* 4: 1188. 1903
Lectotype (here designated): MCVE (unnumbered), "*Dasya rigescens* n. sp. Lesina". Specimen "B".

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